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ANTONELLI, TERRY, STOUT & KRAUS, LLP
1300 NORTH SEVENTEENTH STREET
SUITE 1800
ARLINGTON, VA 22209-9889

EXAMINER
QI, ZHI QIANG

ART UNIT	PAPER NUMBER
2871	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/270,780	HIYAMA ET AL.	
	Examiner	Art Unit	
	Mike Qi	2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 June 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-22,25,26,29,30,33 and 34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *11,19,25,29 and 33* is/are allowed.

6)☒ Claim(s) *1-3,5-10,12-18,20-22,26,30 and 34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 U.S.C. § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-3, 5-7, 10, 12-14, 17-18, 20 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Applicant admitted prior art (AAPA) in view of US 5,587,816 (Gunjima et al).

Claims 1, 13 and 20, the AAPA (the "background of the invention" paragraph in the specification; Figs. 32 - 39) discloses a structure of a liquid crystal display device comprising:

(concerning claims 1, 13 and 20)

- an illumination device (51,53,54 and 56);
- a light control element (40) arranged at a projected light side of the illumination device;
- a reflective polarizer (30) arranged at an upper portion of the light control element (40);
- the light control element (40) is the only light control element arranged between the illumination device (51,53,54 and 56) and the reflective polarizer (30) as shown in Fig.35;

(concerning claims 13 and 20)

- a liquid crystal display element (20) for controlling polarization of projected light projected from the reflective polarizer (30), so that the major axis direction of a pixel must be arranged approximately parallel to a direction wherein the linearly polarized light component of the projected light projected from the illumination device (51,53,54 and 56) is high, in order to obtain maximum light transmittance;
- a screen (10AA) arranged at an upper portion of the liquid crystal display element (see Fig.32), and the viewing angle is widened by the screen (10AA) (see page 5, lines 5-6).

AAPA as shown in Fig.35 does not expressly disclose that the polarized light transmission axis of the reflective polarizer is adjusted so as to be substantially perpendicular or substantially parallel to a control axis of the light control element.

However, Gunjima discloses (col.5, lines 30-41) that the polarizing sheet provided on the light-incident side of the liquid crystal display element, such that the transmittance thereof is maximized with respect to the **p** polarized light component which is emitted from the polarized light separator.

Gunjima also discloses (col.3, lines 11-15 and col.2, lines 27-31) that the **s** polarized light component is reflected and is reused.

Therefore, the transmission axis of polarized light is adjusted and the transmission rate of the projected light from the illumination device is increased.

Gunjima also indicates (col.5, lines 36-41) that an average direction of an optical axis of polarization of a light ray emitted from the flat light guide in the flat illumination device

approximately agrees with the optical axis of polarization of the polarizing sheet on the light-incident side of the liquid crystal display element, i.e., the polarized light transmission axis of the reflective polarizer is approximately in parallel to a major axis direction of pixel of the liquid crystal display element (because the **p** polarized light is transmitted), and the polarized light transmission axis of the reflective polarizer must be adjusted substantially perpendicular or in parallel to the control axis of the light control element so as to obtain a maximized transmittance. so as to obtain a maximized transmittance.

However, AAPA also discloses (as shown in **Fig.36**) that the polarized light transmission axis (31) of the reflective polarizer (30) is adjusted to be substantially perpendicular to the control axis (41) of the light control element (40) so as to obtain a maximum transmittance. AAPA also discloses (page 32, lines 19-21) that the influence of the change in the polarization is small when only one light control element is used. Since using only one light control element would reduce the change of the polarization, and simplified the structure.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange such reflective polarizer in which the polarized light transmission axis of the reflective polarizer is adjusted so as to be substantially perpendicular or in parallel to the control axis of the light control element as claimed in claims 1, 13 and 20 for achieving maximum light transmittance and widen the viewing angle.

Claims 2-3, Gunjima discloses (col.5, lines 30-41) that the polarizing sheet provided on the light-incident side of the liquid crystal display element, such that the transmittance thereof is

maximized with respect to the **p** polarized light component which is emitted from the polarized light separator.

Gunjima also discloses (col.3, lines 11-15 and col.2, lines 27-31) that the **s** polarized light component is reflected and is reused.

Gunjima also indicates (col.5, lines 36-41) that an average direction of an optical axis of polarization of a light ray emitted from the flat light guide in the flat illumination device approximately agrees with the optical axis of polarization of the polarizing sheet on the light-incident side of the liquid crystal display element, i.e., the polarized light transmission axis of the reflective polarizer is approximately in parallel with a major axis direction of pixel of the liquid crystal display element (because the **p** polarized light is transmitted), so as to obtain a maximized transmittance.

Concerning claim 3, the optical axis of the **s** polarized light component is perpendicular to the optical axis of the **p** polarized light component, and the minor axis direction of the pixel also is perpendicular to the major axis direction of the pixel, so that the polarizer having the directivity of the light in a minor axis direction of the pixel.

AAPA indicates (page 5, lines 5-6) that the viewing angle is widened by the screen (10AA).

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange such polarizer and screen as claimed in claims 2-3 for achieving maximized transmittance and widen the viewing angle.

Claim 5, AAPA discloses (page 4, lines 23-25 and Fig.32) that a screen (10AA) has transparent portions in the shape of quadrangular pyramid at the displaying plane side and black absorbing bodies covering the intervals therebetween, i.e., a screen composed to absorb external light (because the black absorbing bodies) and to transmit projected light from the illumination device (because the transparent portions).

Claims 6 and 14, AAPA discloses (page 6, lines 10-20 and Fig.35) that in the light control element (40), generally, PET (polyethylene terephthalate) film having a birefringence material is used. So that the PET film is a birefringent medium, and that is arranged between the illumination device (51,53,54 and 56) and the light control element (40).

Claims 7, 18 and 22, AAPA discloses (page 4, lines 18-22) that the liquid crystal layer (13) is interposed between two transparent substrates (11A, 11B) and two polarizers are arranged on either side thereof.

Gunjima discloses (col.17, lines 36-67 and Fig.1) that a liquid crystal display element using a pair of absorbing type organic polarizing plates (9 and 10), so as to increase the contrast ratio.

Therefore, it would have bee obvious to those skilled in the art at the time the invention was made to use a pair of absorption type polarizers as claimed in claims 7, 18 and 22 for increasing the contrast ratio.

Claims 10 and 17, normally, the reflective color selective layer corresponding to the pixel of the liquid crystal element as shown in the Applicant admitted prior art Fig. 37 to display the color image.

Claim 12, AAPA discloses (Fig.37, 38) that a strip direction of the reflective color selective layer (506 or 512) coincides with an axis in a scattering direction of the screen so as to enhance the brightness of the color display, and that would have been at least obvious.

3. Claims 8, 15, 21 and 26, 30, 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Gunjima as applied to claims 1-3, 5-7, 10, 12-14, 17-18, 20 and 22 above, and further in view of US 6,147,725 (Yuuki et al) and US 5,712,694 (Taira et al).

Claims 8, 15 and 21, Yuuki discloses (col.2, lines 19-54 and Fig.13) that a conventional illumination device comprises:

- a flat waveguide (light guide 206) having a front plane and a rear plane, the front plane constituting a light projecting plane, the rear plane with a plurality of sawtoothed diffused reflection parts (208a-208d) having declined planes (depressed or protruded);
- a light source (lamp 201) arranged adjacently to the waveguide (206);
- a reflector (reflecting sheet 207) arranged at the rear plane of the waveguide and contacting the rear plane of the waveguide (206) (or the illumination device).
- the projected light from the light source (201) is propagated in the waveguide (206) and projected from the light projecting plane of the waveguide (206).

Although Yuuki does not expressly disclose the declined plane of the reflector are manufactured to be mirrors, but using mirror plane for reflecting light was common and known in the art.

Yuuki also indicate (col.2, lines 50-54) that this reflection light is repeatedly carried out in the light guide plate (206), whereby the amount of light passing the polarizing separating film (205) is increased, thereby decreasing loss of the lamp light.

Yunki indicates (col.1, line 52 - col.2, line 54) that the liquid crystal display device described in Figs.12-13 are a **conventional** liquid crystal display device.

Even though Yunki's disclosure is not a prior art according to the priority date of this application, however, the reference Taira also discloses such limitations as claimed in claims 8, 15 and 21.

Taira discloses (col.18, lines 39 - 63; Fig.21) that an illumination device comprising:

- light-guiding plate (1601) having front plane and rear plane, the front plane constituting light projecting plane, the rear plane having V-shape grooves (1606), i.e., a numerous depressed planes, protruded planes or steps and having respective slightly declined planes;
- light source (1605) arranged adjacent to the light guide (1601);
- reflector (1602) arranged at the rear plane of the light guide (1601);
- the projected light from the light source (1605) is propagated in the light guide (1601) and projected from the light projecting plane of the light guide (1601);

- the light is reflected by the reflection face of the V-shape grooves (1606), such that making the reflecting face as a mirror face would increase the light reflectance, and that was common and known in the art as the mirror face having high reflectance.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange such illumination device as claimed in claims 8, 15 and 21 for increasing the amount of light passing the polarizer and decreasing the light leakage.

Claims 26, 30 and 34, the stripes on the reflector are substantially parallel to the major axis direction of a pixel of the liquid crystal display element would be an obvious technique to enhance the brightness of the display, because the stripes of the reflector parallel to the major axis of the pixel electrodes would achieve a higher luminous reflectance, and that would have been at least obvious.

4. Claims 9 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over AAPA and Gunjima as applied to claims 1-3, 5-7, 10, 12-14, 17-18, 20 and 22 above, and further in view of US 6,101,.32 (Wortman et al).

Claims 9 and 16, Wortman discloses (col.9, lines 24-67; col.13, line 59-col.14, line 2) that for isotropic materials, the reflectivity varies as a function of angle of incidence, i.e., the light would be controlled by using the isotropic medium. This principle describing the behavior of uniaxially birefringent system can be applied to create multilayer stacks having the desired optical effect for a wide variety of circumstances and applications. Therefore, it would have been obvious to those skill in the art at time the invention was made to use isotropic medium or

uniaxial birefringent medium as the light control element as claimed in claims 9 and 16 for achieving the desired optical effect in various applications.

Allowable Subject Matter

5. Claims 11, 19, 25, 29 and 33 are allowed.

6. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record neither teaches nor discloses a liquid crystal display device comprises various elements as claimed, more specifically, as the following:

an angle range θ_1 wherein the brightness becomes ½ of the peak value from the illumination device satisfies: $\theta_1 \leq \sin^{-1}(n \sin(\tan^{-1}(2d/t)))$ wherein **t** is thickness of substrate, **n** is refractive index of substrate, **d** is length of minor side of the pixel [claims 11 and 19];

the length ratio of the pixel in major axis direction to the minor axis direction is substantially 3:1 [claims 25, 29 and 33].

The closest references Applicant admitted prior art and the US 5,587,816(Gunjima et al) disclose that a LCD device using illumination device and polarized light separating sheet between a light guide and the display in which reusing the light to increase the brightness, but it does not disclose the specific relation of the angle range with the refractive index of substrate, the substrate thickness and the length of the minor side of the pixel as claimed in claims 11 and 19, and the specific ratio of the pixel in major axis direction to the minor direction as claimed in claims 25, 29 and 33.

Response to Arguments

8.. Applicant's arguments filed on Apr.16, 2002 have been fully considered but they are not persuasive.

Applicant's **only** arguments are as follows:

1) The references do not disclose the feature of a polarized light transmission axis of the reflective polarizer is adjusted so as to be substantially perpendicular or substantially parallel to a control axis of the light control element as claimed in claims 1, 13 and 20.

2) The reference Yunki does not qualify as prior art according to the priority date of March 18, 1998 (filed certified English translation) .

Examiner's responses to Applicant's **only** arguments are as follows:

1) The reference Gunjima indicates (col.5, lines 36-41) that an average direction of an optical axis of polarization of a light ray emitted from the flat light guide in the flat illumination device approximately agrees with the optical axis of polarization of the polarizing sheet on the light-incident side of the liquid crystal display element, i.e., the polarized light transmission axis of the reflective polarizer is approximately in parallel to a major axis direction of pixel of the liquid crystal display element (because the **p** polarized light is transmitted), and the polarized light transmission axis of the reflective polarizer must be adjusted substantially perpendicular or in parallel to the control axis of the light control element so as to obtain a maximized transmittance.

Applicant admitted prior art (AAPA) discloses (**Fig.36**) that the polarized light transmission axis (31) of the reflective polarizer (30) is adjusted to be substantially perpendicular to the control axis (41) of the light control element (40). AAPA also discloses (page 32, lines 19-21) that the influence of the change in the polarization is small when only one light control element is used. Therefore, using only one light control element would reduce the change of the polarization, and simplified the structure.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to arrange such reflective polarizer in which the polarized light transmission axis of the reflective polarizer is adjusted so as to be substantially perpendicular or parallel to the control axis of the light control element as claimed in claims 1, 13 and 20 for achieving maximum light transmittance and widen the viewing angle.

2) The reference Yunki indicates (col.1, line 52 - col.2, line 54) that the liquid crystal display device described in Figs.12-13 are a **conventional** liquid crystal display device. Even though Yunki's disclosure is not a prior art according to the priority date of this application (March 18, 1998), however, the reference Taira (filing date of Sep.14, 1995) also discloses such limitations as claimed in claims 8, 15 and 21.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (703)308-6213 .

Mike Qi
August 6, 2003

ROBERT H. KIM
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800